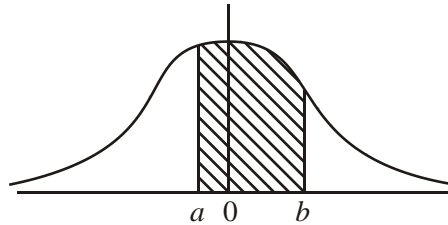


1. The lifespan of a particular species of insect is normally distributed with a mean of 57 hours and a standard deviation of 4.4 hours.

- (a) The probability that the lifespan of an insect of this species lies between 55 and 60 hours is represented by the shaded area in the following diagram. This diagram represents the standard normal curve.



- (i) Write down the values of a and b . (2)
- (ii) Find the probability that the lifespan of an insect of this species is
- (a) more than 55 hours; (1)
- (b) between 55 and 60 hours. (2)
- (b) 90% of the insects die after t hours.
- (i) Represent this information on a standard normal curve diagram, similar to the one given in part (a), indicating clearly the area representing 90%. (2)
- (ii) Find the value of t . (3)

(Total 10 marks)

2. Intelligence Quotient (IQ) in a certain population is normally distributed with a mean of 100 and a standard deviation of 15.

(a) What percentage of the population has an IQ between 90 and 125?

(2)

(b) If two persons are chosen at random from the population, what is the probability that both have an IQ greater than 125?

(3)

(c) The mean IQ of a random group of 25 persons suffering from a certain brain disorder was found to be 95.2. Is this sufficient evidence, at the 0.05 level of significance, that people suffering from the disorder have, on average, a lower IQ than the entire population? State your null hypothesis and your alternative hypothesis, and explain your reasoning.

(4)

(Total 9 marks)

3. The mass of packets of a breakfast cereal is normally distributed with a mean of 750 g and standard deviation of 25 g.

(a) Find the probability that a packet chosen at random has mass

(i) less than 740 g;

(ii) at least 780 g;

(iii) between 740 g and 780 g.

(5)

(b) Two packets are chosen at random. What is the probability that both packets have a mass which is less than 740 g?

(2)

(c) The mass of 70% of the packets is more than x grams. Find the value of x .

(2)

(Total 9 marks)

4. A company manufactures television sets. They claim that the lifetime of a set is normally distributed with a mean of 80 months and standard deviation of 8 months.

(a) What proportion of television sets break down in less than 72 months?

(2)

(b) (i) Calculate the proportion of sets which have a lifetime between 72 months and 90 months.

(ii) Illustrate this proportion by appropriate shading in a sketch of a normal distribution curve.

(5)

(c) If a set breaks down in less than x months, the company replace it free of charge. They replace 4% of the sets. Find the value of x .

(3)

(Total 10 marks)

5. The heights of certain flowers follow a normal distribution. It is known that 20% of these flowers have a height less than 3 cm and 10% have a height greater than 8 cm.

Find the value of the mean μ and the standard deviation σ .

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(Total 6 marks)

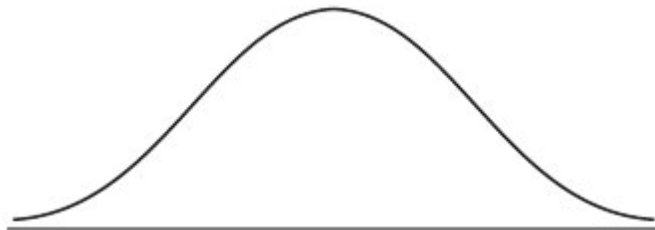
6. The heights of certain plants are normally distributed. The plants are classified into three categories.

The shortest 12.92% are in category A.

The tallest 10.38% are in category C.

All the other plants are in category B with heights between r cm and t cm.

- (a) Complete the following diagram to represent this information.



(2)

- (b) Given that the mean height is 6.84 cm and the standard deviation 0.25 cm, find the value of r and of t .

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(5)

(Total 7 marks)

7. The weights of a group of children are normally distributed with a mean of 22.5 kg and a standard deviation of 2.2 kg.

- (a) Write down the probability that a child selected at random has a weight more than 25.8 kg.
- (b) Of the group 95% weigh less than k kilograms. Find the value of k .

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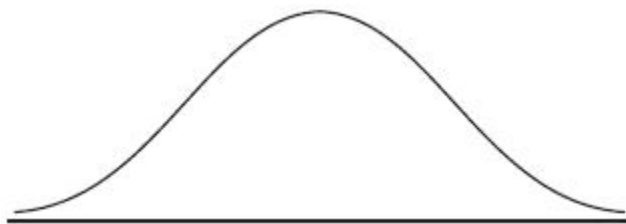
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- (c) The diagram below shows a normal curve.



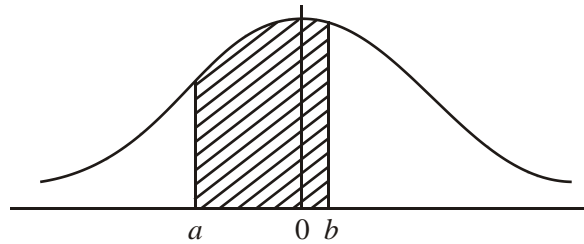
On the diagram, shade the region that represents the following information:

87% of the children weigh less than 25 kg

(Total 6 marks)

8. Reaction times of human beings are normally distributed with a mean of 0.76 seconds and a standard deviation of 0.06 seconds.

- (a) The graph below is that of the **standard** normal curve. The shaded area represents the probability that the reaction time of a person chosen at random is between 0.70 and 0.79 seconds.



- (i) Write down the value of a and of b .
- (ii) Calculate the probability that the reaction time of a person chosen at random is
- (a) greater than 0.70 seconds;
- (b) between 0.70 and 0.79 seconds.

(6)

Three percent (3%) of the population have a reaction time less than c seconds.

- (b) (i) Represent this information on a diagram similar to the one above. Indicate clearly the area representing 3%.
- (ii) Find c .

(4)

(Total 10 marks)

9. Residents of a small town have savings which are normally distributed with a mean of \$3000 and a standard deviation of \$500.

- (i) What percentage of townspeople have savings greater than \$3200?
- (ii) Two townspeople are chosen at random. What is the probability that **both** of them have savings between \$2300 and \$3300?
- (iii) The percentage of townspeople with savings less than d dollars is 74.22%. Find the value of d .

(Total 8 marks)

10. The heights of a group of students are normally distributed with a mean of 160 cm and a standard deviation of 20 cm.

- (a) A student is chosen at random. Find the probability that the student's height is greater than 180 cm.
- (b) In this group of students, 11.9% have heights less than d cm. Find the value of d .

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(Total 6 marks)